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and 51 cm. long, the ends of which were covered with windows of clear rock salt. This tube was evacuated with an oil pump and then filled with air which had been passed through phosphorous pentoxide. It therefore contained carbon dioxide which causes a small amount of absorption.

The transmission was determined by noting a series of galvanometer deflections caused by black body radiation (800° C.) which was passed through the evacuated tube and focused upon a linear thermopile of bismuth-silver. Immediately thereafter a stopcock was opened and either dried or undried air was permitted to enter, under atmospheric pressure.

Using air containing 9.95 grams of water per cubic meter the absorption amounted to 0.9 %.

Using dry air, the average value of the absorption (3 series of measurements) was 0.09%; which is the magnitude of the errors of observation. In view of the fact that in the measurements of the radiation constant, the column of (dry) air was less than 50 cm. if any correction was to be applied it could hardly be greater than 0.1%.

Millikan's calculations of σ , on the basis of recent determinations of Planck's element of action, h , from photoelectric measurements, and from his redetermination of the electron, e , is $\sigma = 5.72 \times 10^{-12} \pm 0.034$ watt cm. $^{-2}$ deg. $^{-4}$, which is exactly the result I obtained by direct measurement. The only misgiving is that this coincidence is accidental. In conclusion it may therefore be stated that further experiments are in progress in which the whole radiometric apparatus is in a vacuum, the radiator being an enclosure surrounded by molten metal.

¹ Coblentz, W. W., *Washington, Bul. Bur. Standards*, 12, 1916, (533).

² Millikan, R. A., these PROCEEDINGS, 3, 1916, (231).

³ Coblentz, W. W., *Washington, Bull. Bur. Standards*, 9, 1913, (283).

THE DEVELOPMENT OF A SOURCE FOR STANDARD WAVE-LENGTHS AND THE IMPORTANCE OF THEIR FUNDAMENTAL VALUES

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The determination of wave-lengths in International Units forms an important part of the working program of a large number of laboratories. The primary International Unit is the absolute wave-length of the red cadmium line.¹ The secondaries are referred individually to the primary

standard and are thus freed from the systematic errors of the Rowland system.

For the main purposes which the new wave-lengths should serve, namely, the comparison of the wave-lengths in cosmical and terrestrial sources, the determination of the constants in series formulae, and the investigation of the effect of changed terrestrial conditions, the standard and derived lines should be accurately reproducible and their wave-lengths should represent what may be considered the fundamental or unperturbed vibration of the emitting centers. Recent work at this observatory has shown, however, that the 6 mm.-6 amp. iron arc adopted as the source for International Secondary Standards,² while fulfilling to a moderate degree the first condition, gives for large classes of lines wave-lengths vitiated by pole effect.³

The investigation has involved the development of a standard source from which under ordinary working conditions both reproducible and fundamental wave-lengths are obtainable. The methods followed and the tests applied in its development are given in a Contribution from Mount Wilson Solar Observatory where the investigation will be reported in full.

The presence of pole effect in the International arc was shown by direct comparison between its center and the center of the proposed or provisional standard and also by comparing the wave-lengths of the International Secondaries belonging to groups *c* and *d* with their wave-lengths obtained from the new standard by means of the interferometer. The two independent methods gave the same result, namely, a systematic error of +0.006 Å in the International wave-lengths of the lines of these two groups.

The importance of this result lies in the systematic character and the magnitude of the error, which is of the order of sun-arc displacements upon which our intimate knowledge of solar conditions must depend. If the solar wave-lengths of such lines are compared with the published International values, the solar lines apparently shift to the violet; but when compared with wave-lengths representing the fundamental vibrations, the same lines are displaced to the red. Such comparisons have already led and must necessarily lead to mistaken interpretations of solar phenomena.⁴ The normal behavior of the great majority of iron lines, the stable lines of groups *a* and *b* is displacement to the red in the solar spectrum, whatever form of arc is used as the source. When the International or the 6 mm.-6 amp. Pfund arc is used, the iron lines of groups *c* and *d* are displaced to the violet and those of group *e* abnormally to the red, but with the proposed source the lines of these groups yield

displacements of the same sign and order of magnitude as the stable lines of groups *a* and *b*.

Tests of recently published wave-lengths of calcium and manganese show that they are contaminated by the disturbing influence of pole effect and it appears probable that little of the new work in wave-length determination is sufficiently free from this influence to meet the more and more exacting demands of the present and immediate future, for high accuracy in wave-length measurement.

We recommend that light be taken from a narrow equatorial zone of a 4 to 5 fold enlarged image of an iron arc of the Pfund type 12 mm. long carrying a current of 5 amperes. With such an arc the exposure time for the region λ 5600 to the violet is not excessive; for the region, λ 5600 to λ 6000, it is somewhat long when very high dispersion is required; but in this region the International arc is entirely lacking in stable lines and no element yields a sufficient number of lines of good quality here; from λ 6000 to the red the International Secondaries belong to group *b*. They are free from perturbing influences and for them any form of iron arc may be used as the source.

To obtain dependable wave-lengths of other elements the necessary preliminary is an examination for pole effect. If it is found to be present, a method for its elimination should be worked out and applied before attempting the wave-length measurements. As the method of the elimination depends upon the element, the problem of wave-length determination is no longer one of mere routine but offers opportunities for a real investigation.

¹ *Smithsonian Physical Tables*, p. 172.

² *Trans. Int. Union Coop. Solar Research*, 4, (59).

³ St. John, C. E., and Babcock, H. D., *Mt. Wilson Contrib.*, No. 106; *Astroph. J.*, Chicago, 42, 1915, (231-262).

⁴ St. John, C. E., *Mt. Wilson Contrib.*, No. 123, pages 11 and 27; *Astroph. J.*, Chicago, 44, 1916, (311-341), pages 321 and 337.

ON THE PRESENCE OF ALBUMOSES IN EXTRACTS OF THE POSTERIOR LOBE OF THE HYPOPHYSIS CEREBRI

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In recent years some very definite statements have been made in respect to the chemical nature of the active principle or principles of the hypophysis cerebri (pituitary gland). Among the claims advanced none are more sharply defined than those published by H. Fühner¹ on